

U.S. TSUBAKI BS/DIN ROLLER CHAIN

CHAIN DRIVE SELECTION

SELECTION PROCEDURE

- 1) The following factors must be considered when selecting roller chains for transmission needs.
 - The power to be transmitted.
 - The speed and the diameters of the driving shaft and the driven shaft.
 - The distance between the centers of the shafts.
- 2) Use Table I to obtain the service factor. (The "Service Factor" table refers to the type of machine and source of power.)
- 3) Multiply the HP value by the service factor to obtain the design HP value.
- 4) Use Table III page A-52 to obtain the appropriate chain number and the number of teeth for the small sprocket by referring to the number of revolutions of the high speed shaft (the driving shaft when the speed is reduced; the driven shaft when the speed is increased) and the design HP value. For a smoother chain drive, a smaller pitch chain is suggested. If a single strand chain does not satisfy the transmission requirements, use a multi-strand chain. If the distance between the shafts and the diameter of the sprockets must be relatively small due to space considerations, a multiple strand roller chain with a smaller pitch may be used.

- 5) After determining the number of teeth for the small sprockets, confirm if the sprocket will meet the shaft diameter requirements.
- 6) The number of teeth for the large sprocket is determined by multiplying the number of teeth for the small sprocket by the speed ratio. While it is preferable that the number of teeth for the small sprocket be greater than 15, it is suggested that the number of teeth for the large sprocket not exceed 120. By reducing the number of teeth for the small sprocket, the number of teeth for the large sprocket can also be reduced.

Table II: Multiple-Strand Factor

Number of Roller Chain Strand	Multiple-Strand Factor
Double Strand	1.7
Triple Strand	2.5

Number of Pitches of Chain

$$L = \frac{N_1 + N_2}{2} + 2C + \frac{\left(\frac{N_2 - N_1}{6.28}\right)^2}{C}$$

Any fraction of L is counted as one pitch.

Center Distance in Pitches

$$C = \frac{1}{8} \left\{ 2L - N_1 - N_2 + \sqrt{(2L - N_1 - N_2)^2 - \frac{8}{9.86} (N_2 - N_1)^2} \right\}$$

- L: Number of pitches of chain
 N₁: Number of teeth (small sprocket)
 N₂: Number of teeth (large sprocket)
 C: Center distance in pitches

Chain Speed

$$S = \frac{P \cdot N \cdot n}{12} \text{ (ft./min.)}$$

- S: Chain speed (ft./min.)
 P: Chain pitch (inch)
 N: Number of teeth of sprocket
 n: rpm of the sprocket

Chain Tension from HP

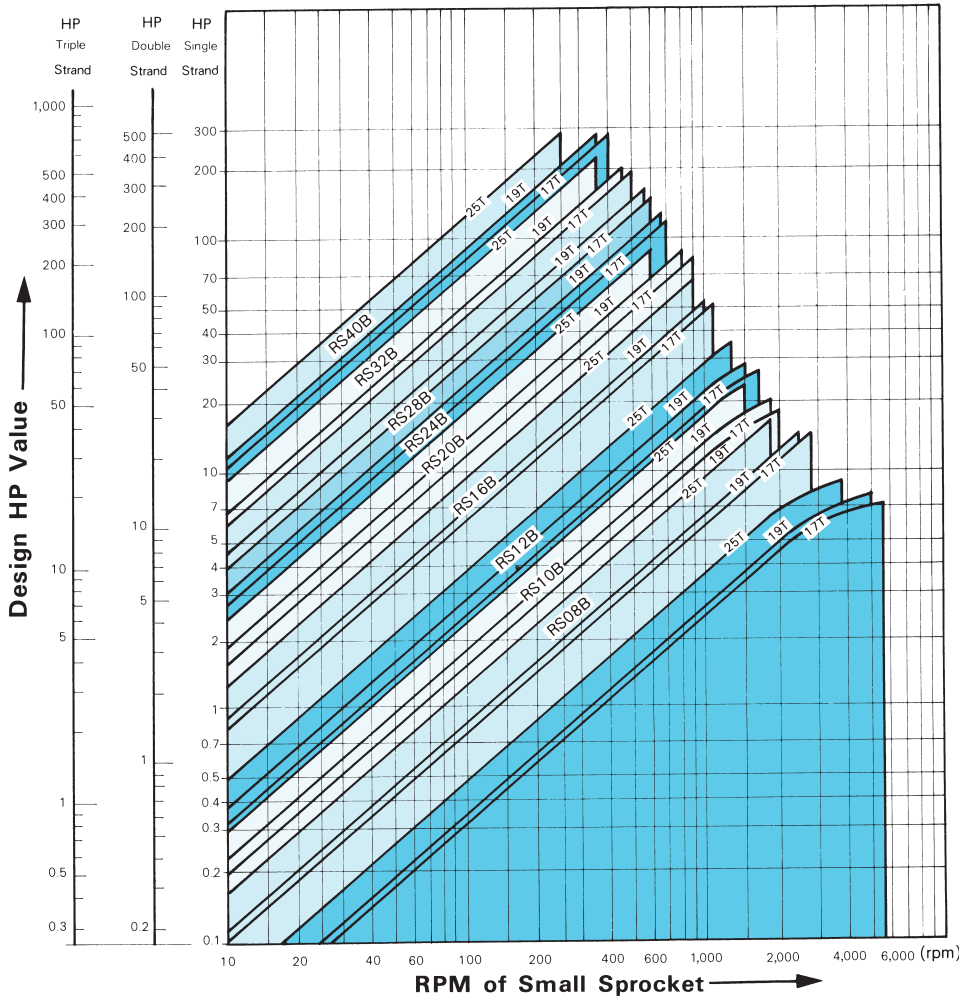
$$T = \frac{33,000 \cdot \text{HP}}{S} \text{ (lbs.)}$$

- T: Chain tension (lbs.)

Table I: Service Factor

Type of Impact	Machines	Source of Power		
		Electric Motor or Turbine	Internal Combustion Engine	
			With hydraulic drive	Without hydraulic drive
Smooth	Belt conveyors with small load fluctuation, chain conveyors, centrifugal blowers, general textile machines, machines with small load fluctuation.	1.0	1.0	1.2
Some impact	Centrifugal compressors, marine engines, conveyors with some load fluctuation, automatic furnaces, dryers, pulverizers, general machine tools, compressors, general work machines, general paper mills.	1.3	1.2	1.4
Large impact	Presses, construction or mining machines, vibration machines, oil well rigs, rubber mixers, general machines with reverse or impact load.	1.5	1.4	1.7

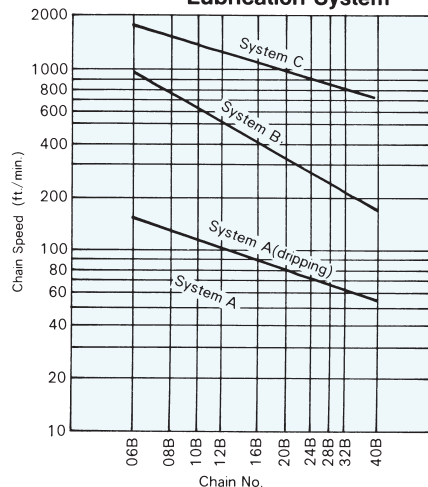
Table III: BS Roller Chain Selection Table



The selection table is based on the following conditions:

- 1) The chains are operated under ordinary conditions. The ambient temperature range is between 15°F and 140°F. They are not to be used in an atmosphere where abrasive dust or corrosive gas is present or when the humidity is exceptionally high.
- 2) The two transmission shafts are in a horizontal position and the chains are properly installed.
- 3) The suggested lubrication system shown on Table IV is used.
- 4) The load does not change significantly during transmission. The "Service Factors" given in Table I are used when the chains are used under various operating conditions. The load conditions will affect the life of the chain. The increase in the horsepower rating of multiple-strand roller chains cannot be calculated simply by multiplying the horsepower rating of one strand by the total number of strands, since the load on each strand is not exactly the same. In order to estimate the service life of a multiple-strand chain, the "Multiple-Strand Factor" given in Table II must be used.

Table IV: Chain Speed and Lubrication System



Note: Refer to page A-77 for details of lubrication system.

Example

- Data:
1. Type of application: Centrifugal Blowers
 2. Source of power: Electric Motor
 3. HP to be transmitted: 40 hp
 4. Driving shaft: 600 rpm
 5. Driven shaft: 200 rpm
 6. Center distance: 19 inches
 7. Space limit: Max. 24 inches

- Step 1** Use Table I and determine the service factor.
Service factor (SF): 1.0
- Step 2** Obtain design HP
Design HP = HP to be transmitted • SF
= 40 hp • 1.0
= 40 hp
- Step 3** Obtain the chain size and the number of teeth of the small sprocket from the selection table for 40 hp and 600 rpm.

According to the selection table, the selected chain and sprocket rpms are:

- (a) RS12B-3 chain and 25-tooth sprocket
- (b) RS16B-2 chain and 17-tooth sprocket
- (c) RS16B-1 chain and 25-tooth sprocket

- * For (a), the necessary number of teeth for both small and large sprockets are 25 teeth and 75 teeth respectively, since the speed ratio is 1/3 (200/600 rpm). But the outside diameter of both sprockets, 6.3 inches for 25 teeth and 18.3 inches for 75 teeth, exceeds the limitation (6.3 inches + 18.3 inches > 24 inches). Therefore, these sprockets cannot be installed.
- * For (c), the necessary number of teeth for both small and large sprockets are 25 teeth (outside dia. 8.4 inches) and 75 teeth (outside dia. 24.4 inches), respectively. It exceeds the space limitation again (8.4 inches + 24.4 inches > 24 inches).
- * For (b), the necessary number of teeth for both the small and large sprockets are 17 (outside dia. 5.9 inches) and 51 (outside dia: 16.8 inches). It satisfies the space limitation (5.9 inches + 16.8 inches < 24 inches). A combination of RS16B-2, and 17 teeth and 51 teeth must be used to fulfill all the necessary requirements.

- Step 4** Use Table IV to determine the lubrication method.

$$\text{Chain speed (S)} = \frac{P \cdot N \cdot n}{12}$$

$$= \frac{1 \cdot 600 \cdot 17}{12} = 850 \text{ ft./min.}$$

System B is suggested.

- Step 5** Obtain the number of pitches of chain (L).

$$= \frac{N_1 + N_2}{2} + 2C + \frac{(N_2 - N_1)^2}{6.28^2 C}$$

$$= \frac{17 + 51}{2} + 2 \cdot \frac{19}{1} + \frac{(51 - 17)^2}{\frac{6.28^2}{19}}$$

$$= 73.35 \rightarrow 74 \text{ links}$$